

R11A-0554-03EN

Operating Manual - English



RackCDU Operating Manual

Edition August 2016

Copyright © 2016 Fujitsu Technology Solutions GmbH.

All rights reserved.

Delivery subject to availability; right of technical modifications reserved.

All hardware and software names used are trademarks of their respective manufacturers.

- The contents of this manual may be revised without prior notice.
- Fujitsu assumes no liability for damages to third party copyrights or other rights arising from the use of any information in this manual.
- No part of this manual may be reproduced in any form without the prior written permission of Fujitsu.

Before reading this manual

For your safety

This manual contains important information for safely and correctly using this product.

Carefully read the manual before using this product. Pay particular attention to the accompanying manual "Safety Notes and Regulations" and ensure these safety notes are understood before using the product. Keep this manual and the manual "Safety Notes and Regulations" in a safe place for easy reference while using this product.

Aluminum electrolytic capacitors

The aluminum electrolytic capacitors used in the product's printed circuit board assemblies and in the mouse and keyboard are limited-life components. Use of these components beyond their operating life may result in electrolyte leakage or depletion, potentially causing emission of foul odor or smoke.

As a guideline, in a normal office environment (25°C) operating life is not expected to be reached within the maintenance support period (5 years).

However, operating life may be reached more quickly if, for example, the product is used in a hot environment. The customer shall bear the cost of replacing replaceable components which have exceeded their operating life.

Note that these are only guidelines, and do not constitute a guarantee of trouble-free operation during the maintenance support period.

High safety use

This product has been designed and manufactured to be used in commercial and/or industrial areas as a server.

When used as visual display workplace, it must not be placed in the direct field of view to avoid incommoding reflections (applies only to TX server systems).

The device has not been designed or manufactured for uses which demand an extremely high level of safety and carry a direct and serious risk of life or body if such safety cannot be assured.

These uses include control of nuclear reactions in nuclear power plants, automatic airplane flight control, air traffic control, traffic control in mass transport systems, medical devices for life support, and missile guidance control in weapons systems (hereafter, "high safety use"). Customers should not use this product for high safety use unless measures are in place for ensuring the level of safety demanded of such use.

Please consult the sales staff of Fujitsu if intending to use this product for high safety use.

Version history

Issue number	Reason for update
1.0 / February 2016	Initial release
2.0 / February 2016	2.2 Specification : Height of RackCDU changed
3.0 / August 2016	Minor modification

Contents

1	Introduction	6
1.1	Concept and target groups for this manual	6
1.2	Documentation overview.....	6
2	Functional overview	7
2.1	Features	7
2.2	Specification.....	9
2.3	RackCDU Monitoring System.....	11
3	Important information	12
4	Tools at facility site	13
5	Hardware installation	13
5.1	Unseal the Reservoir Cap before Operating	13
5.2	Connecting RackCDU to facilities water line.....	15
5.3	Inject facility water to RackCDU and bleed air from facility water loop.....	17
5.4	Connecting server tube sets to RackCDU and Server node	20
5.5	Connecting the power cord and LAN cable for monitoring system.....	21
6	Maintenance	22
7	Restrictions and attentions	23
8	Disconnecting RackCDU from Facilities Water	24
9	Trouble shooting	27

1 Introduction

Liquid Cooling Technology enables a very effective and efficient cooling of PRIMERGY multi-node servers. With heat exchangers directly installed on CPU, RAM and co-processor cards the warm-water liquid cooling solution can remove the heat generated in a server. Combining liquid cooling with traditional air cooling guarantees full compatibility with existing data center infrastructures.

Liquid Cooling Technology consists of RackCDU, server cooler and tube set. RackCDU is mounted in a rack extension and is connected by a tube set to the liquid cooler in each server node. In addition to these three components data centers installing RackCDU must supply facilities cooling liquid to each rack where RackCDU is installed.

1.1 Concept and target groups for this manual

This operating manual is intended for those responsible for installing the hardware and ensuring that the system runs smoothly. It contains the information you need to put your RackCDU enclosure into operation.

1.2 Documentation overview

More information on your RackCDU can be found in the following documents.

- RackCDU Monitoring Software User Guide
- RackCDU Maintenance manual
- "Safety Notes and Regulations" manual

For information on the individual CX400 M1/CX600 M1 server enclosure and server nodes, please refer to the following manuals.

- "Quick Start Hardware - PRIMERGY CX400 M1 Server Enclosure"
- "FUJITSU Server PRIMERGY CX400 M1 Server Enclosure Operating Manual"
- "FUJITSU Server PRIMERGY CX400 M1 Server Enclosure Upgrade and Maintenance manual"
- "FUJITSU Server PRIMERGY CX2550 M1 Server Node Upgrade and Maintenance manual"
- "D3343 BIOS Setup Utility for FUJITSU Server PRIMERGY CX2550 M1 Server Node" Reference Manual
- "Quick Start Hardware - PRIMERGY CX600 M1 Server Enclosure"
- "FUJITSU Server PRIMERGY CX600 M1 Server Enclosure Operating Manual"
- "FUJITSU Server PRIMERGY CX600 M1 Server Enclosure Upgrade and Maintenance manual"
- "FUJITSU Server PRIMERGY CX1640 M1 Server Node Operating Manual"
- "FUJITSU Server PRIMERGY CX1640 M1 Server Node Upgrade and Maintenance manual"
- "D3727 BIOS Setup Utility for FUJITSU Server PRIMERGY CX1640 M1 Server Node" Reference Manual

2 Functional overview

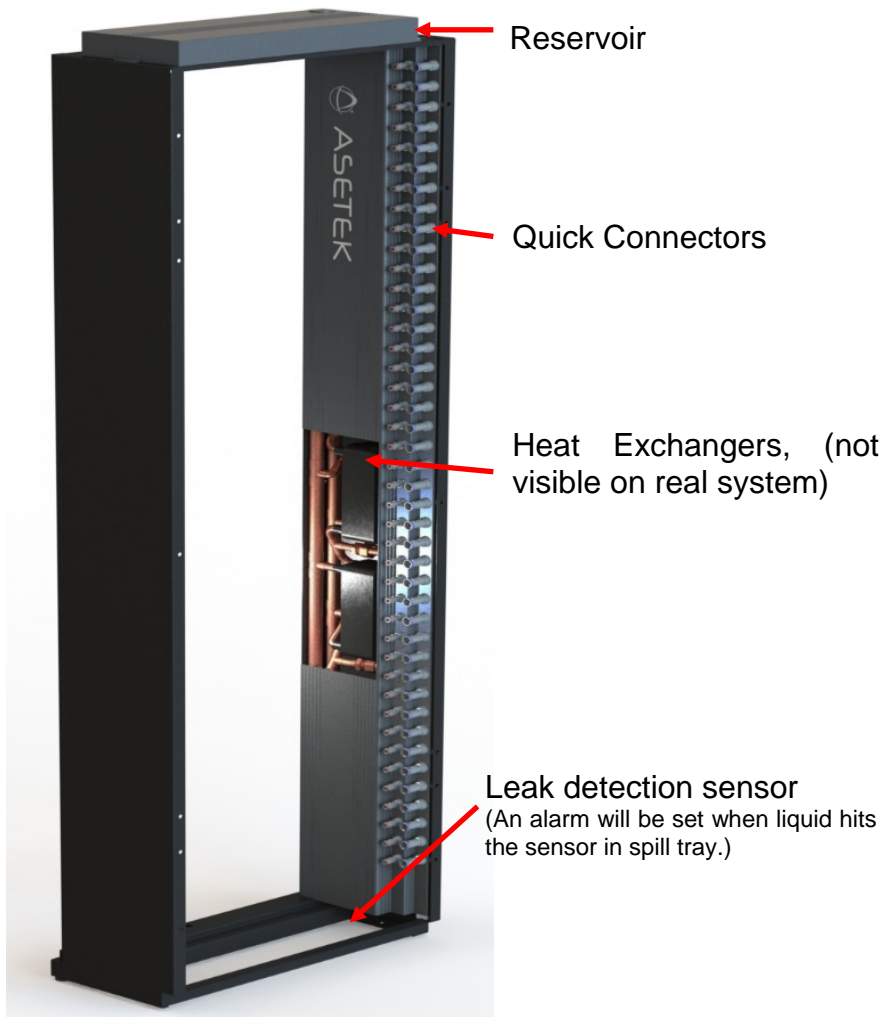
2.1 Features

RackCDU extensions are designed to mount on the rear of a rack in place of the rear door and hinges. Once the extension is installed the doors may be mounted on the face of the extension. The extensions contain a rack level coolant distribution unit (CDU), giving the system its name, RackCDU. The RackCDU has two functions, to distribute liquid to the servers in the rack to which it is attached and to reject heat generated by the connected servers into facilities liquid. The rejection of heat is accomplished by liquid-to-liquid heat exchangers. These heat exchangers keep facilities liquid and server cooling liquid completely separate. There is no mixing of facilities and server liquid. Only heat passes between the two liquids in the heat exchanger.

The RackCDU is connected to server liquid coolers via pairs of connecting tubes. One tube is used to deliver cooled (supply) liquid to the server. The other returns heated (return) liquid from the servers to the heat exchangers for heat rejection into facilities liquid.

All three components of the RackCDU system are delivered pre-filled with server cooling liquid. There is no need for data center staff to handle server cooling liquid when installing RackCDU or when removing and replacing servers during maintenance. The connecting tubes connect to both the RackCDU and server coolers with locking dripleless quick connectors. These connectors seal immediately when disconnected keeping the server coolant in the tube and RackCDU or server cooler.

The RackCDU is typically delivered mounted in a 10.5 inch rack extension that includes a monitoring system, reservoir. The RackCDU is a passive device. Server cooler and facilities pumps provide circulation. Monitoring system at top of RackCDU provide real time information on operating condition. Reservoir at top of the RackCDU preserve server coolant for more than 5year of operation.



RackCDU



Server cooler (CPU,Mem)



Tubes

2.2 Specification

Facility water requirement

Specification	Value
Water Temperatures (*1, *2)	Facilities Supply Max: 45°C Min: Higher of 2°C or above dew point Facilities Return Max: 59°C Min: Higher of 2°C or above dew point
Facilities Temperature Rate of Change	3°C per 5-minute cycle
Water Quality	Per ASHRAE 2011 Thermal Guidelines for Liquid Cooled Data Processing Environments, section F, table 3

*1 max temperature depends on configuration of server node.

*2 RackCDU does not have the ability to protect against the formation of dew in the RackCDU or within the server. The facilities liquid system must assure that liquid below the dew point is not delivered to RackCDU.

Specification	Value
Corrosion inhibition	Compatible with wetted materials in facilities side of RackCDU: <ul style="list-style-type: none"> • Copper • Brass • Stainless Steel
Pressure	Maximum: 6.86 bar (100 PSI) Minimum: 0.686 bar (10 PSI)
Flow	Maximum: 2500 l/h (11 GPM us) RackCDU impedance at above flow: 0.276 bar (4.05 PSI)

Required Facility Water quality

Parameter	Recommended limits
pH	7 to 9
Corrosion Inhibitor(s)	Required
Sulfides	<10 ppm
Sulfate	<100 ppm
Chloride	<50 ppm
Bacteria	<1,000 CFUs/ml
Total Hardness (as CaCO ₃)	<200 ppm
Residue After Evaporation	<500 ppm
Turbidity	<20 NTU (Nephelometric)

Electrical and Network for Monitoring system

Specification	Value
Electrical	Power Supply Voltage: 100VAC to 240VAC, 50/60Hz auto-detecting Connector: IEC 320 C14 Power Supply Output: 70W Max, 15W Normal Operation
Network	Physical Layer: Copper wire, RJ-45 Connector Application Layer: Web browser interface, e-mail alerts & alarms

Mechanical Spec. of Rack CDU

Specification	Value
size	H 2140 x W 800 x D 280(mm) (when RackCDU is assembled to Rack, H can be max:2145mm from floor to the top of RackCDU)
weight	85kg
type	Bottom Fed, facility pipe: 3/4"NPT Top Fed, facility pipe: 3/4"NPT Bottom Fed, facility pipe: 3/4"BSPP Top Fed, facility pipe: 3/4"BSPP
Quick connectors	80 sets

The coolant in the server loop

The coolant in the server liquid coolant is a mixture of 65% deionized water and 35% Dowcal 20-G or Dowcal 200. Both Dowcal 20-G and 200 are primarily propylene glycol enhanced with corrosion inhibitors. The coolant is not a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910. 1200.

2.3 RackCDU Monitoring System

RackCDU includes a monitoring system that provides information on liquid temperatures, pressures and flow rates as well as alerts for problems including leak detection and low coolant via Web UI. Please refer “RackCDU Monitoring Software User Guide”

Display of monitoring system

ASETEK
DATA CENTER LIQUID COOLING

User: Admin Node: 0 Mode: Agent

SENSOR OVERVIEW: **SNMPAGENT**

Description:	Value:	
Facility water temperature SUPPLY:	17.9 °C	■
Facility water temperature RETURN:	19.6 °C	■
Server liquid temperature SUPPLY:	19.4 °C	■
Server liquid temperature RETURN:	23.1 °C	■
RackCDU™ liquid level:	OK	■
RackCDU™ leak detection:	No Leak	■
RackCDU™ pressure:	0.011 bar	■
Facility pressure:	2.037 bar	■
Facility water flow:	996.30 l/h	■
Heat Load: (600 sec)	1.51 kW	

3 Important information





In this chapter you will find essential information regarding safety.

- Any failure to observe the guidelines in this manual, and any improper repairs could expose the user to risks (electric shock, energy hazards, fire hazards) or damage the equipment.
- If the server enclosure has been moved from a cold environment, condensation may form both inside and on the outside of the machine.
- Wait until the RackCDU has acclimatized to room temperature and is absolutely dry before starting it up. Material damage may be caused to the server enclosure if this requirement is not met.
- Only transport the server enclosure in the original packaging or in packaging that protects it from impacts and jolts.
- The unit automatically adjusts itself to a mains voltage in a range of 100 - 240 V. Ensure that the local mains voltage lies within these limits.
- This device must only be connected to properly grounded power outlets or insulated sockets of the rack's internal power supply with tested and approved power cords.
- Never connect or disconnect data transmission lines during a storm (risk of lightning hazard).
- Make sure that no objects (e.g. jewelry, paperclips etc.) or liquids can get inside the server enclosure (risk of electric shock, short circuit).
- In emergencies (e.g. damaged casing, controls or cables, penetration of liquids or foreign bodies), switch off the server enclosure immediately, remove all power plugs and contact your sales outlet or customer service team.
- The circuit boards and soldered parts of internal options are exposed and can be damaged by static electricity. Before handling them, first touch a metal part of the server enclosure to discharge static electricity from your body.
- Do not touch the circuitry on boards or soldered parts. Hold the metallic areas or the edges of the circuit boards.
- RackCDU installation and maintenance etc. use stepladder. Do be careful not to fall from stepladder.

4 Tools at facility site

Following tools are needed for setup and maintenance etc.

Facility site always prepare tools. If the service engineer of Fujitsu ask it for maintenance, please provide.

	equipment	Spec	
1	Wet/dry Vacuum	More than 8 litter capacity	
2	Low-sided Pan	Less than 4cm tall	
3	Pan	More than 4 litter capacity	
4	Step ladder	Over 1m Height	

5 Hardware installation

Important: Please don't power on server node until installation is completed.

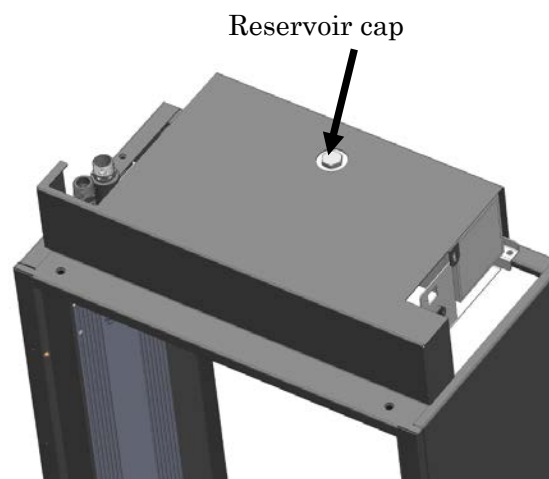
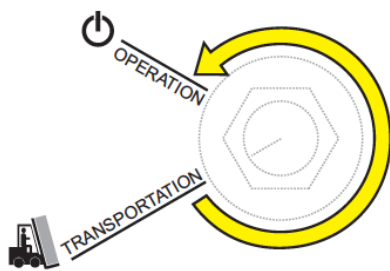
5.1 Unseal the Reservoir Cap before Operating

The server side of RackCDU is shipped as a sealed system. The system must be unsealed (opened to atmospheric pressure) prior to operation. The reservoir is located

at the top of the RackCDU and this reservoir is sealed with a reservoir cap. The unit arrives with the reservoir cap closed and sealed with a partial vacuum. The fill port needs to be loose (unsealed) during normal operation. To unseal the RackCDU, turn the reservoir cap counterclockwise approximately 7/8ths of a turn as shown on the label at the top of the reservoir.

If the RackCDU ever needs to be removed from the rack or shipped, the reservoir cap should be firmly tightened prior to removing or shipping.

Note: the reservoir should never be completely full. The air space in the reservoir allows for the server coolant to expand as it heats up during normal operations. The monitoring system provides a low liquid level alert when the reservoir needs to be filled.



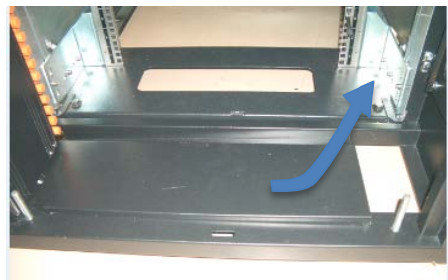
5.2 Connecting RackCDU to facilities water line

Facilities liquid connections are available at the bottom of the RackCDU.

The facility liquid supply (“cold”) lines for RackCDU are marked with the word “Supply” and the return (“hot”) lines with “Return” cut into the adjacent metal support.

The facilities liquid connection points are accessed from above the floor by removing the spill detection tray at the bottom of the RackCDU.

- (1) Lift the right side of the spill tray up while sliding it to the right.



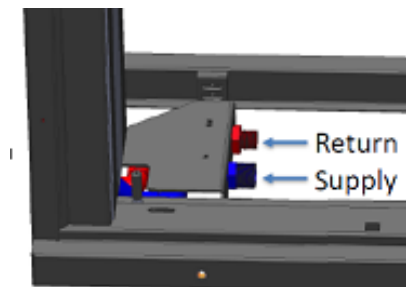
- (2) Unplug the Leak sensor from the cable in the bottom of the RackCDU.



- (3) Remove the spill tray fully from the RackCDU



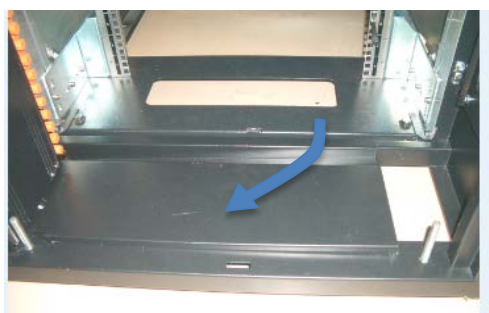
- (4) Connect pipe for the Supply and Return to facility line.



(5) Re-plug the Leak Sensor cable to the cable in the bottom of the RackCDU.



(6) Slide the left end of the spill tray. The right edge the spill tray down and into place.



5.3 Inject facility water to RackCDU and bleed air from facility water loop

RackCDU have a small air bleed valve for assisting in bleeding the air from the facility liquid lines. It is mounted on the top of the RackCDU. This bleed valve should be used with “Air Bleeding - Schrader valve” kit.

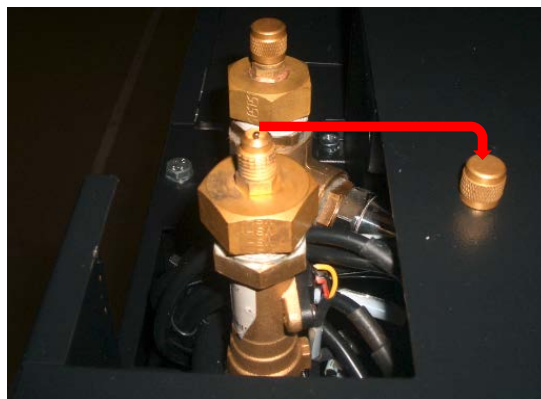


Air bleeding valve

Air Bleeding - Schrader valve kit



- (1) Remove cap of air bleed valve in supply line on RackCDU .

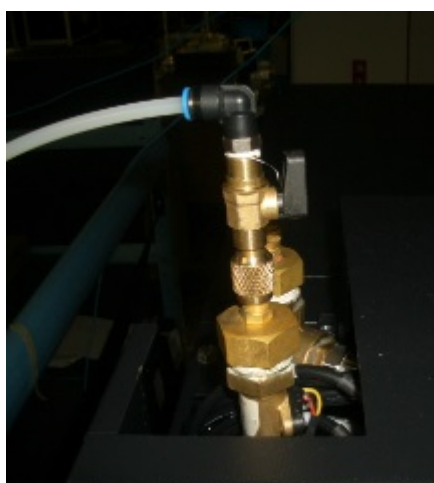


(2) “Air Bleeding - Schrader valve” have switch (on or off).

Before attaching “Air Bleeding - Schrader valve” to RackCDU, switch needs to be “off” position.



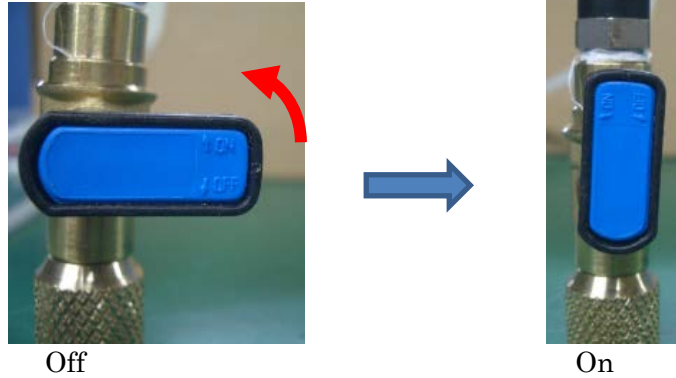
(3) Attach “Air Bleeding - Schrader valve” to RackCDU.



(4) Place the open end of an “Air Bleeding - Schrader valve” kit in the pan.



- (5) Open the valves on both the supply and return liquid loop of the facilities side to inject facility liquid into RackCDU. Then, change switch of “Air Bleeding - Schrader valve” to “on”. Bleed the air from the RackCDU until bubbles stop flowing from the tube.



- (6) After bleeding air, change switch of “Air Bleeding - Schrader valve” to “off”. And remove “Air Bleeding - Schrader valve” from RackCDU.
- (7) Repeat this process on air bleeding valve for return line as well. If the pan starts to fill, use the wet/dry vacuum to suck the liquid out of the pan.

5.4 Connecting server tube sets to RackCDU and Server node

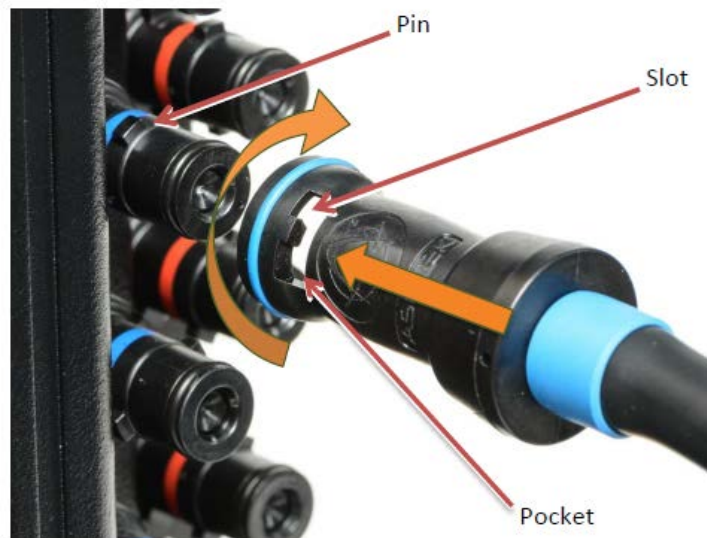
Liquid coolers in the server nodes connect to RackCDU distribution manifold via sets of connection tubes. These tube sets are filled at the factory with coolant.

The supply tubes are marked with a blue ring. The supply tubes connect to the vertical row of connectors marked with a blue band. The return tubes are marked with a red ring. They connect to the vertical row of connectors marked with a red band.

The connectors on the RackCDU have two raised square pins on opposite sides of their narrow barrel. The quick connectors on the tubes have a pair of “J” shaped grooves on their inside surface. Align the ends of the “J” shaped grooves with the pins and push the tube quick connects onto the RackCDU quick connects. When the pins reach the bottom of the “J” shaped grooves, twist the tube connectors clockwise approximately 15 degrees until a stop is felt then release.

To disconnect the connectors push the tube connectors toward the RackCDU (about 1/8th inch) and twist the connector counterclockwise until it stops. Release the tube connector and it will be pushed off the RackCDU connector by the springs inside both connectors.

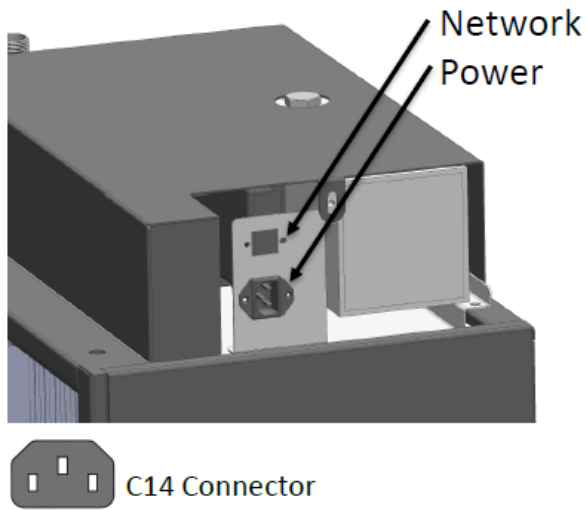
Other end of server tube connects to server node as well as RackCDU.



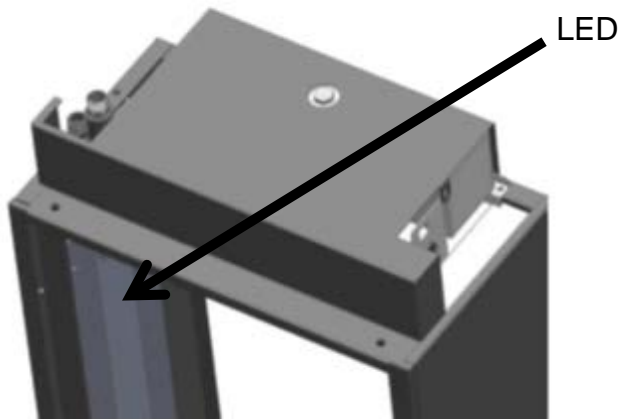
1. Align Pin to Slot.
2. Push female connector on to male.
3. Rotate clockwise until pin drops into pocket.

5.5 Connecting the power cord and LAN cable for monitoring system

The monitoring system requires a network connection and power. The power supply is a universal type capable of accepting 100VAC to 240VAC and either 50 or 60 Hz. The connection points for network and power are located at the top right side of RackCDU. The network connects via a standard network cable with RJ45 connectors. The power inlet on the monitoring is a C14 male and uses a power cord with a C13 connector. The plug end of the power cord is chosen based on the wall or power distribution sockets available.



There is LED inside wall of RackCDU. When power cable is connected, LED turn on.



AC cable	LED
connect	ON
disconnect	OFF

6 Maintenance

Several spare parts are defined for trouble rarely. In case of trouble, please refer "RackCDU Maintenance manual" that shows how to replace parts etc. When replacement of parts is needed, "server node power off" or "disconnection of facility water loop from RackCDU" might be needed. Both actions are not done by Fujitsu service engineer. "Server node power off" needs to be done by customer. "Disconnection of facility water loop from RackCDU" needs to be done by superintendent of facility.

Replacement parts	Server node power off	Disconnection of facility water
Monitoring Box	No need	No need
Power Supply	No need	No need
Facilities Pressure Sensor	Need	Need
Server Coolant Pressure Sensor	Need	No need
Facilities Flow Sensor	Need	Need
LED Indicator	No need	No need
Leak Sensor	No need	No need
Level Sensor	Need	No need
Hex-Head Plug 1/2"(Reservoir cap)	No need	No need
Refilling of server coolant	Need	No need

7 Restrictions and attentions

There are some restrictions and attentions for liquid cooling system.

(1) ServerView for liquid cooling

ServerView supports server node. But ServerView does not supports RackCDU. When checking status of RackCDU, please use monitoring system of RackCDU.

(Reference: RackCDU Monitoring Software User Guide)

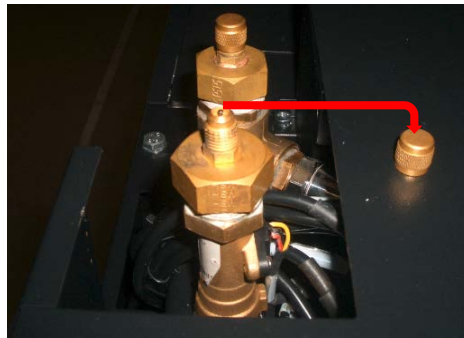
8 Disconnecting RackCDU from Facilities Water

In case of RackCDU disconnection from facility water, please take following procedure.

- (1) Stop the water flow to RackCDU on facility side.
- (2) Remove the spill tray fully from the RackCDU.
(Please refer "5.2 Connecting RackCDU to facilities water line")
- (3) Put low-sided pan under RackCDU.



- (4) Before removing connection between RackCDU and facility line, relieve pressure in RackCDU using "Air Bleeding - Schrader valve" kit. If you don't relieve pressure, facility water splash when disconnecting RackCDU.
Follow the procedure (4) – (9) to relieving pressure.
- (5) Remove cap of air bleed valve in supply line on RackCDU.



- (6) "Air Bleeding - Schrader valve" have switch (on or off).
Before attaching "Air Bleeding - Schrader valve" to RackCDU, switch needs to be "off" position..



(7) Attach “Air Bleeding - Schrader valve” to RackCDU.



(8) Place the open end of an “Air Bleeding - Schrader valve” kit in the pan.



(9) Change switch of “Air Bleeding - Schrader valve” to “on”. Relieve pressure until bubbles stop flowing from the tube.



Off



On

(10) Repeat this process on air bleeding valve for return line as well. If the pan starts to fill, use the wet/dry vacuum to suck the liquid out of the pan.

(11) Put the hose from the wet/dry vacuum into the low-sided pan and turn on the wet/dry vacuum.



(12) Disconnect connection between RackCDU and return line, then coolant from RackCDU is drained into pan. Vacuum coolant.

9 Trouble shooting

■ "RackCDU leak detection" shows red indicator in monitoring system.

There is leak sensor in spill tray on bottom of RackCDU. An alarm will be set when liquid hits the sensor in spill tray. Spill of server coolant is suspected. Gracefully shut down servers, remove AC power of server and RackCDU, and please check if spill occur. Please refer "Important information" in RackCDU Maintenance Manual.

■ "RackCDU liquid level" shows red indicator in monitoring system.

There is level sensor in reservoir. An alarm will be set when liquid level of reservoir is low. RackCDU is delivered with server coolant in reservoir for more than 5year of operation. If alarm of level sensor is set before 5year operation, leakage is suspected. Gracefully shut down servers, remove AC power of server and RackCDU, and please check if spill occur. Please refer "Important information" in RackCDU Maintenance Manual.

■ Unexpected error(red indicator in monitoring system) of following sensor ("RackCDU pressure", "Facility pressure", "Facility water flow".)

Please check whether threshold of sensor on monitoring system is appropriate. If it is fine, please check connection sensor. Please refer RackCDU Maintenance manual about how to replace.

■ RackCDU Pressure is high

This may indicate that the reservoir cap on the RackCDU has not been opened. See section 5.1 for the proper operation of the reservoir cap.

■ Facilities flow is zero or very low.

This may indicate that:

- One of the valve on the facilities supply or return line at facility site are partially or fully closed. Both valves should be open.
- The pumping system for liquid at facility site has been shut off or failed.
- Gracefully shut down the servers and determine the reason for low flow.

■ Facilities pressure is zero or very low.

This may indicate that:

- Both of the valves on the facilities supply and return line at facility site are closed.
Both valves should be open.
- The pumping system for facilities liquid has been shut off or failed.
- Gracefully shut down the servers and determine the reason for low pressure.

■ Facilities pressure is too high and there is no facilities flow:

This indicates that the valves on both supply and return at facility site are closed. Open them as quickly as possible.

■ Low liquid temperature

Liquid temperatures should be above dew point. In a data center operating in the ASHRAE recommended range a temperature at or below 17°C is at risk of being below dew point.

- Servers should not be powered on when liquid temperatures are at or below dew point. Turning on the servers will bring sub-dew point liquid into the server where it may cause damage to the servers via condensation.
- If below dew point facilities liquid is detected while servers are running gracefully shut down (power off) the servers. Do not run servers at idle. At idle the pumps in the server are still running but the server is not generating much heat. Running at idle makes it more likely that sub-dew point liquid will get into the server.

■ High liquid temperature

Gracefully shut down servers. Check for loss of facilities liquid flow or loss of function at the facilities heat rejection point, e.g. failure of cooling fans at the heat rejection point.